



# Section 1-4

*Quartiles, Percentiles, and Box Plots*



# Warm-up

*Use the table from example 3 on page 23*

Job	Annual Salary
President	\$250,000
Vice-President	\$100,000
Warehouse Supervisor	\$60,000
Sales Supervisor	\$60,000
Sales Representative NE	\$40,000
Sales Representative NW	\$40,000
Sales Representative SE	\$40,000
Sales Representative SW	\$40,000
Secretary to President	\$25,000
Secretary to Vice-President	\$20,000
Warehouse Worker	\$20,000
Warehouse Worker	\$20,000
Custodian	\$18,000
Custodian	\$16,000
Custodian	\$16,000



# Warm-up

a. Find the median of the data

\$40,000

b. Find the median of the first half of the data

\$60,000

c. Find the median of the second half of the data

\$20,000



*We just found the quartiles of the data!*



*Quartiles: Values that divide the data into four equal sets of data*

◆ *This means that each grouping of the data is 25% of the total*

*Second Quartile: The median of the entire set*

*First Quartile: The median of the first half of the data*

*Third Quartile: The median of the second half of the data*

*Interquartile Range: The range of values between the first and third quartile. To calculate IQR:  $Q_3 - Q_1$*

*Five-Number Summary: The minimum,  $Q_1$ , Median,  $Q_3$  and maximum*





## *Example 1*

*Use the following scores of a math midterm to find  $Q_1$ ,  $Q_3$ , and the median.*

*43 68 73 78 80 88 92 52 70 74 78 82 89 93 65 70 75*

*78 85 90 94 66 71 75 78 87 90 94 67 72 76 79 87 90 98*

*What should we do first?*

*Put the data in order!*



# Example 1

43 52 65 66 67 68 70 70 71 72 73 74 75 75 76 78 78 78  
78 79 80 82 85 87 87 88 89 90 90 90 92 93 94 94 98

Minimum: 43

Maximum: 98

Median: 78

$Q_1$ : 71

$Q_3$ : 89



*Percentile: Tells what percent of the values are less than or equal to the one you are looking at*

◆ *To calculate:*

- 1. Find where in the data set your value is; i.e. 12<sup>th</sup> spot*
- 2. Divide that number by the total number of values*
- 3. Multiply by 100 and round*







## Example 2

Use the same scores from Example 1.

a. Find the percentile rank of 89.

$$\frac{27}{35} = .7714285714 = 77^{\text{th}} \text{ percentile}$$

b. What test score is at the 20<sup>th</sup> percentile?

$.20(35) = 7 \leftarrow$  That's not a score...it's a position

What score is in the 7<sup>th</sup> position?

70







## *Box Plot or Box-and-Whisker Plot:*

*A graphical way of showing the distribution of data using a box and two whiskers...and maybe some dots*

- 1. Draw a number line that includes the minimum and maximum values*
- 2. Draw a rectangle where the left edge is above  $Q_1$  and the right edge is above  $Q_3$*
- 3. Inside the box, draw a vertical line segment at the median*
- 4. Draw the whiskers out from the edges of the box to the minimum and maximum values*
- 5. Find any outliers and fix the whiskers*





*How do you find outliers?*

- 1. Calculate the IQR ( $Q_3 - Q_1$ )*
- 2. Add  $1.5 \times \text{IQR}$  to  $Q_3$ . Any values above this are outliers.*
- 3. Subtract  $1.5 \times \text{IQR}$  from  $Q_1$ . Any values below this are outliers.*

*You may have to fix your whiskers if there are any outliers. Mark them with a dot...or figure them out before you draw the whiskers!*

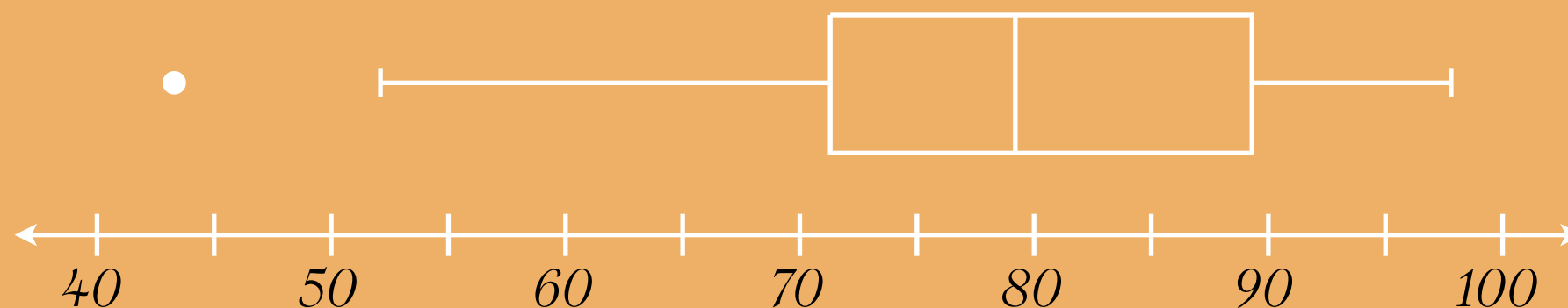


# Example 3



*Guess what? We're going to use the scores from Example 1 again!*

*a. Create a box-and-whisker plot for the scores.*





## Example 3

*b. Are there any outliers? If so, what are they?*

*Yes, 43 is an outlier.*

*c. Use your graphing calculator to create the boxplot.*



# Homework

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